HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	George Adams Fall Chinook Fingerling Program
Species or Hatchery Stock:	Hood Canal Fall Chinook
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Hood Canal Puget Sound
Date Submitted:	August 23, 2002
Date Last Updated:	August 20, 2002

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

George Adams Hatchery Fall Chinook - Fingerling Program

1.2) Species and population (or stock) under propagation, and ESA status.

Hood Canal Fall Chinook (*Oncorhynchus tshawytscha*)

1.3) Responsible organization and individuals

Name (and title):	Ron Warren, Region 6 Fish Program Manager Denis Popochock, Complex Manager	
Agency or Tribe:	Washington Department of Fish and Wildlife	
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

In addition to WDFW production, the Hood Canal Salmon Enhancement Group (HCSEG), Long Live the Kings (LLTK) operate cooperative projects that produce fall chinook fingerlings or unfed fry in Hood Canal.

George Adams Hatchery operates under *U.S. v. Washington,* the Puget Sound Salmon Management Plan and the Hood Canal Salmon Management Plan between WDFW and the Point No Point Treaty Council (PNPTC) which includes the Skokomish, Port Gamble S'Klallam, Jamestown S'Klallam and Lower Elwha S'Klallam tribes. The co-management process requires that both the State of Washington and the relevant Puget Sound tribes agree on the function and purpose of each hatchery program and on production levels. Guidelines for production at Hood Canal facilities are set out in the Hood Canal Salmon and Steelhead Production 1996 MOU and the Future/Current Brood Document.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Funding for fingerling production at George Adams is provided through the State General Fund. George Adams receives $242,000 annually from the State General Fund and additional mitigation funding of $84,000 annually from Tacoma Public Utilities. George Adams Hatchery is staffed with 5 full-time employees.

Funding for the HCSEG/LLTK Wild Salmon Conservancy (WSC) projects comes from the US Fish and Wildlife Service (USFWS) through a cooperative agreement between the HCSEG and USFWS. Additional funding for fish food is provided through the Washington State Aquatic Lands Enhancement Act (ALEA) funding. The WSC projects are staffed with volunteers.

There is no funding for the citizen volunteer or educational co-op projects.

1.5) Location(s) of hatchery and associated facilities.

George Adams Hatchery: Located at RM 1.0 on Purdy Creek (16.0005), a tributary of the lower Skokomish River (16.0001) which flows into Hood Canal in southwestern Puget Sound near Union, Washington. Basin name: Hood Canal.

Hood Canal Salmon Enhancement Group Projects:

1) Endicott Pond (a.k.a. Rick's Pond) Wild Salmon Conservancy: Site is located near the mouth of an Unnamed trib (16.xxxx)of the lower Skokomish R. (16.0001) at RM 2.9 adjacent to Endicott Pond near Union, Washington. Basin name: Hood Canal.

3) Hamma Hamma Conservancy: Located at RM 1.7 of John Creek (16.0253), a trib to the Hamma Hamma River (16.0251) which flows into Hood Canal near Eldon, Washington. Basin Name: Hood Canal.

1.6) Type of program.

Isolated harvest (The intent of these programs is to be "Isolated" but an unknown number of adults stray onto the spawning grounds of the Skokomish River)

1.7) Purpose (Goal) of program.

Augmentation and mitigation

Hatchery chinook production has been developed to augment harvest opportunities and, in part, to provide partial mitigation for reduced natural production in the Skokomish system, primarily caused by hydroelectric dams on the North Fork Skokomish. The Skokomish Tribe, whose reservation is located near the mouth of the river, has a reserved treaty right to harvest chinook salmon.

1.8) Justification for the program.

This program will be operated to provide fish for harvest while minimizing adverse effects on listed fish. This will be accomplished in the following manner:

1. Release fingerling smolts with expected brief freshwater residence.

2. Beginning with the 1999 brood, release excess chinook fry, if any, into landlocked lakes rather than into Purdy or Finch Creeks, as in the past.

3. Beginning with 1999 brood, eliminate transfers of George Adams chinook for release into east Hood Canal streams (Union, Tahuya and Dewatto Rivers) to avoid freshwater and estuarine interactions with Hood Canal summer chum. Previously, these streams received a total of 130,000 fingerlings annually.

4. Beginning with 2000 brood, eliminate transfers of George Adams fall chinook eggs to Hood Canal-area school and cooperative volunteer programs for fry releases in Hood Canal. This program change should also reduce interactions between George Adams fall chinook and listed chinook and summer chum.

1.9) List of program "Performance Standards".

1.10) List of program "Performance Indicators".

Performance Standards and Indicators for Puget Sound **Integrated Harvest** Chinook programs.

Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
Produce adult fish for harvest	Survival and contribution rates	Monitor catch and measure survivals using CWT data
Meet hatchery production goals	Number of juvenile fish released - **3,800,000**	Estimating number of fish planted (weighing / counting fish), monitoring proximity to hatchery production goals, number released recorded on hatchery divisions "plant reports", data available on WDFW data base. Future Brood Documents.

Manage for adequate escapement where applicable	Hatchery and wild return rates	Monitoring hatchery/wild return rates through trapping (at the hatchery or at weir), redd and snorkel surveys on the spawning grounds plus catch records.
Minimize interactions with listed fish through proper broodstock management	Number of broodstock collected - **~ 2,670 adults**	Measuring number of fish actually spawned and killed to meet egg take goal at the hatchery. Hatchery Records. Start trapping prior to historical start of the run, continue trapping throughout the run, dates and times are recorded on hatchery divisions "adult reports", data available on WDFW data base. Hatchery records CWT data and spawning ground surveys Spawning guidelines Hatchery records
	Sex ratios	
	Timing of adult collection/spawning - **early August thru early October**	
	Number of wild fish used in broodstock -	
	Hatchery stray rate	
	Return timing of wild adults/hatchery - **early August thru early October**	
	Adherence to spawning guidelines - **1:1 with 5 fish pools**	
	Number of listed fish passed upstream - **none (see section 2.2.3)**	
Minimize interactions with listed fish through proper rearing and release strategies	Juveniles released as smolts	FBD and hatchery records Hatchery records and historical out-migrant data CWT data and marked vs unmarked ratios of adults
	Out-migration timing of listed fish / hatchery fish **April thru early June/mid May to early June**	
	Size and time of release **60-80 fpp/ May release**	

Maintain stock integrity and genetic diversity	Effective population size	Spawning guidelines
	Hatchery-Origin Recruit spawners	Spawning ground surveys
Maximize in-hatchery survival of broodstock and their progeny; and Limit the impact of pathogens associated with hatchery stocks, on listed fish	Fish pathologists will monitor the health of hatchery stocks on a monthly basis and recommend preventative actions / strategies to maintain fish health	Co-Managers Disease Policy Fish Health Monitoring Records
	Fish pathologists will diagnose fish health problems and minimize their impact	
	Vaccines will be administered when appropriate to protect fish health	
	A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings	
	Fish health staff will present workshops on fish health issues to provide continuing education to hatchery staff.	
Ensure hatchery operations comply with state and federal water quality standards through proper environmental monitoring	NPDES compliance	Monthly NPDES records

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

For George Adams there is no specific program goal for adult broodstock collection, only for eggtake of 4.57 million fall chinook eggs. Assuming a fecundity of 4,500 eggs per female and a 60% male / 40 % female sex ratio, and a prespawning mortality of < or = 5%, the number of adults required to meet the eggtake goal would be about 2,670. Note that the 2000 eggtake of 4.57 million has been reduced from the previous goals of 5.72 million. Adults in excess of escapement goals will be killed and sold.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling	Purdy Creek (16.0005)	3,800,000
Yearling		

Note: Programmed releases of 30,000 George Adams fall chinook transferred from the hatchery to the HCSEG conservancy projects (see section 10 & Rick's Pond HGMP).

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Table X. Program performance for George Adams fingerling fall chinook. Survivals are based on CWT recoveries obtained form the Pacific States Marine Fisheries Commission Regional Mark Information System database (www.rmis.org). Hatchery escapements are from the WDFW Hatchery Escapement database.

George Adams

	Smolt-to-Adult Survival	Adult Production	Hatchery Escapement	Wild Escapement
	(%)	(Survival x Release)		
Year	(Brood Year)	(Brood Year)	(Return Year)	(Return Year)
1988	0.11	4,147	4439	Unknown
1989	0.08	3,342	2513	Unknown
1990	0.01	452	2185	Unknown
1991	0.04	1,562	3068	Unknown
1992	0.15	3,262	294	Unknown
1993	0.25	3,293	612	Unknown
1994	0.05	754	495	Unknown
1995	0.11	3,854	5687	Unknown
1996	0.84	15,215	3394	Unknown
1997	0.05 (prelim data)	1,933	7181	Unknown
1998	Not yet available	Not yet available	7049	Unknown
1999	Not yet available	Not yet available	Not yet available	Unknown

The escapement levels for the last 5 years to the Hood Canal have averaged 1,112 (includes Skokomish, Hamma Hamma, Dosewalips and the Duckabush rivers).

The average survival rate for 1988-1997 broodyears is approximately .17%. 1997 data is still preliminary.

Broodstock levels back to the hatchery rack for brood years 1995 through 2001 were 5,687, 3,184, 2,243, 6,354, 8,469, 5,520 and 9,831, respectively.

1.13) Date program started (years in operation), or is expected to start.

Production of Hood Canal fingerling fall chinook began at George Adams Hatchery in 1961. The Skokomish River WSC project began with the 1995 brood year.

1.14) Expected duration of program.

Ongoing.

1.15) Watersheds targeted by program.

Skokomish River (16.0001),
Purdy Creek (16.0005)

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

None

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

None

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

Puget Sound ESU fall chinook (Hood Canal fall chinook stock (WDF 1993):

We have little information on the adult age structure, sex ratio, size range or smolt distribution and emigration timing of wild chinook in Hood Canal streams. We do not know to what extent that George Adams hatchery-origin fingerling fall chinook interact with wild Hood Canal chinook. Hood Canal wild chinook are thought to emigrate mainly as sub-yearlings, probably from April through early June. The summer flows in the South Fork Skokomish River may be too low to support chinook through the summer, though some areas in the Lower North Fork do have sufficient water (C. Baranski, WDFW, personnel communication, March 2000). Hood Canal fall chinook spawn from mid-September through October with a peak in mid-October (WDFW and WWTIT 1994). Chinook spawning occurs in the mainstem Skokomish River, the lower South Fork Skokomish and tributaries such as Vance Creek, lower North Fork Skokomish and tributaries, and the lower reaches (below anadromous barriers) of Lilliwaup Creek, John Creek, the Duckabush, Dosewallips, Big and Little Quilcene Rivers, and the lower Union, Tahuya and Dewatto Rivers. Chinook spawning in many of these streams may be largely the result of hatchery releases.

Tissue samples of naturally-spawning fall chinook are being collected in Hood Canal streams for genetic analysis. Preliminary analysis of Skokomish basin adult spawners and juveniles suggests that the naturally-spawning chinook are largely, though perhaps not entirely, of George Adams/Hoodsport Hatchery origin (memo from A. Marshall, WDFW, dated 4 May 1999.

Because there is no specific information on wild smolt temporal and spatial distribution in Hood Canal streams, the extent to which they might interact with hatchery chinook released locally is unknown.

Hood Canal Summer Chum:

Available data have been compiled in Tynan (1997) and the draft Hood Canal Summer Chum Conservation Initiative (WDFW and PNPTC).

Puget Sound Bull Trout (South Fork Skokomish stock (WDFW 1998)):

There is little or no information on adult age class structure, sex ratio, juvenile life history strategy or smolt emigration timing. Hood Canal Ranger District (Olympic National Forest) staff recently conducted a radio-tagging study of (presumed) bull trout in the South Fork Skokomish River (Ogg and Taiber 1999). The objectives of the study were to examine seasonal migration patterns and to identify spawning grounds and spawning times. In addition, Forest Service staff have been conducting trapping, snorkeling and electrofishing surveys for bull trout in the South Fork. They believe that fluvial and resident life history forms are present. There is no evidence from their work of an anadromous life history form, though anadromous fish may be present. Sexually mature fluvial fish range from 38 to 59 cm. During the course of the telemetry study, spawning migration activity in fluvial fish began in late October when the water temperature dropped below 7°C and river flow increased. Spawning time appears to be from late October through late November. Spawning grounds have tentatively been identified in the mainstem South Fork from RM 18 through RM 23.5 and in Church, LeBar and Brown Creeks. Juvenile rearing areas include, but should not be considered restricted to, RM 19 through RM 23.5.

In general, chinook are not seen above the Gorge of the South Fork beginning at RM 7 (C. Baranski, WDFW, personnel communication, March, 2000) so interactions between hatchery chinook and bull trout are not expected unless fluvial or anadromous fish, if any, move downstream into the lower South Fork or the mainstem Skokomish River.

-Identify the ESA-listed population(s) that will be directly affected by the program.

None

-Identify the ESA-listed population(s) that may be incidentally affected by the program.

Puget Sound chinook, Hood Canal summer chum and Puget Sound bull trout

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds

This has not been determined for the ESA listed population. WDFW SASSI document (1992) lists the following:

Summer/Fall chinook stock in Hood Canal is *healthy.*

Hood Canal summer chum ESU:

1. Union River are *Healthy*
2. Lilliwaup and Jimmycomelately Creeks are *critical*
3. Hamma Hamma, Duckabush, Dosewallips, Big/Little Quilcene, and Snow Creek are Depressed.

Puget Sound bull trout in Hood Canal are *viable.*
Source: Summer Chum Salmon Conservation Initiative

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

George Adams Hatchery program fish have survived at an average rate of .18 % (range .01 to .84%) for the years 1988 to 1996. (RMIS TS-1 reports)

No estimates of productivity are available for Puget Sound chinook or for Puget Sound bull trout in the Hood Canal region.

No good estimates of Hood Canal summer chum productivity are available because age data are not available. Recruit-per-spawner estimates done by WDFW, the NWIFC and PNPTC range from 1.5 to 1.8, but none of these are reliable at present (J. Ames, WDFW, personnel communication, February 2000).

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Table X. 1988-1998 spawner abundance data for Hood Canal fall chinook, Hood Canal summer chum and Lake Cushman bull trout/Dolly Varden. Chinook data are from the 1998 WDFW chinook run reconstruction. Summer chum data are from J. Ames (WDFW, personnel communication). Bull trout data are from WDFW (1998) through 1996 and from D.Collins (WDFW, personnel communication) thereafter.

Year	Fall Chinook	Summer Chum	Bull Trout/Dolly Varden
1988	2,853	2,967	152
1989	1,425	598	174
1990	724	429	299
1991	1,858	746	299
1992	940	1,954	285
1993	1,172	712	412
1994	1,072	2,050	281
1995	1,999	8,971	250
1996	1,028	19,683	292
1997	492	8,420	No data collected
1998	1,803	3,407	119[1]
1999	3,020	3,882	90[1]
2000	1,690	7,987	---
2001	No data at this time	No data at this time	

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Analysis of the 1988, 89, 90, 91, 92, 93, 94 and 95 broods show a low stray rate (.08 to .56%) within the same GDU and none outside the GDU. The stray rate risk rating is "Low" per the WDFW Hatchery Risk Assessment Worksheet, Version 2, 11/2/00. (88 % of the stray rates above were from yearling releases. No more yearling releases take place at George Adams.

In recent years hatchery-origin chinook, identified by adipose-fin clips and scale patterns, have been recovered from spawning grounds in the mainstem Skokomish River during sampling for genetic analysis. In 1998, 61 chinook spawners were sampled, ten of which were coded-wire tagged. They originated from George Adams Hatchery (n=3), Hoodsport Hatchery (n=2), Long Live the Kings releases from Rick's Pond (n=4) and the now -defunct

[1] Counts were incomplete due to high water (D.Collins, personal communication, February, 2000)

Sund Rock net pens (n=1). Seven of these fish had been released as yearlings and three as fingerlings. Since George Adams releases only fingerlings, the yearlings would probably have come from the Long Live the Kings project, Hoodsport Hatchery or net pens in Hood Canal. Scale analysis of the untagged adults in the genetics sample showed that an additional 16 fish had hatchery yearling scale patterns. Thus, hatchery-origin fish comprised at least 43% of the sample. More fish in the sample may have been of hatchery origin, but chinook released as fingerlings would have scale patterns indistinguishable from those of wild chinook, which outmigrate mainly as fingerlings.

There was/is high potential for George Adams chinook released from Rick's Pond and from the now defunct net pen programs in lower Hood Canal to stray because they were released from sites to which they cannot return.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Broodstock collection for George Adams fall chinook may result in take of listed Puget Sound fall chinook through capture at the trap in Purdy Creek from August 1 through late-September. Entry into the trap may result in injury to listed chinook. Listed wild chinook cannot be distinguished from unmarked hatchery fish, so they cannot be returned to Purdy Creek or the Skokomish River (see section 7.9). The principal effect of this take is to remove listed chinook from the wild spawning population. The risk of this take is unknown because we do not know how many wild chinook are likely to enter Purdy Creek and reach the hatchery trap.

Chinook spawner surveys in Hood Canal streams may result in take (harassment) of wild Hood Canal chinook. The WDFW contact for Hood Canal-area spawner surveys is Thom Johnson (johnsthi@dfw.wa.gov).

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Because hatchery-origin and listed wild chinook cannot generally be distinguished in the trap or the adult holding pond, we do not know the numbers of listed wild chinook captured, injured or dead at George Adams.

-Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

Annual take of listed wild Puget Sound chinook cannot be quantified since they cannot be distinguished from unmarked George Adams Hatchery chinook. The likely sources of take resulting from George Adams Hatchery operations are broodstock collection, injury or mortality during incubation and rearing, injury or mortality during egg or fry transport to school or other co-operative programs, injury or mortality during rearing in co-operative programs, injury or mortality during on-station or off-station release.

Worst-case scenarios would include hatchery broodstock collection which consists only of listed wild fish, then subsequent loss of the all progeny of wild fish through catastrophic flooding, equipment failure or disease.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Because take levels cannot be quantified, contingency plans to limit take to pre-determined numbers have not been developed at George Adams Hatchery.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

The George Adams fall chinook program is conducted in a manner consistent with the Hood Canal Summer Chum Conservation Initiative. Specifically, chinook are not released until after April 1 in order to reduce potential interactions with listed Hood Canal summer chum. There are no summer chum in the Skokomish River. Those from Lilliwaup Creek are expected to migrate to salt water in February and March and then to swim seaward quickly (Tynan 1992). They are expected to clear the area well before the release of George Adams fingerling chinook in May. WDFW considers that both juveniles and returning adults from the on-station program pose low risk for competition or predation to summer chum (Tynan 1999).

Releases of George Adams fall chinook from the HCSEG/LLTK Wild Salmon Conservancy (WSC) sites in the Hamma Hamma River (John Creek) are more problematic. There are wild listed summer chum in these streams. Chinook fingerling smolts are scheduled for release in May. Wild summer chum should have cleared the area around the mouth of the Hamma Hamma well before May, so should pose a low risk to summer chum juveniles. However, there is no way to remove any returning chinook adults, consequently they may pose a high risk of competition with summer chum spawners (Tynan 1999). The HGMPs for these programs are being reviewed.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

This HGMP is consistent with relevant standing orders and agreements. The Puget Sound Salmon Management Plan (PSSMP) and the Hood Canal Salmon Management Plan (HCSMP) are federal court orders that currently control both the harvest management rules and production schedules for salmon in Hood Canal under the *U.S. v. Washington* management framework. The parties to the SCSCI recognize that it may be necessary to modify these plans in order to implement the recommendations that will result from the SCSCI. However, the provisions of the PSSMP and HCSMP will remain in effect until modified through court order by mutual agreement.

3.3) Relationship to harvest objectives.

Tribal and non-Indian commercial and recreational fisheries directed at fall chinook and other species produced through WDFW hatchery releases will be managed to minimize incidental effects to listed chinook salmon and summer chum salmon. Time and area, gear-type restrictions, and chinook and summer chum release requirements will be applied to reduce takes of listed salmon in the Hood Canal mainstem, extreme terminal marine area, and river areas where these fisheries directed at other hatchery species occur. Compliance with the fisheries management strategy defined in the SCSCI will lead to fisheries on WDFW hatchery-origin stocks that are not likely to adversely affect listed chinook or listed summer chum.

Each year, state, federal and tribal fishery managers plan the Northwest's recreational and commercial salmon fisheries. This pre-season planning process is generally known as the North of Falcon process, which involves a series of public meetings between federal, state, tribal and industry representatives and other concerned citizens. The North of Falcon planning process coincides with meetings of the Pacific Fishery Management Council, which sets the ocean salmon seasons at these meetings.

For example, during 2000 as an outcome of the North of Falcon process, the state/tribal Puget Sound Chinook Harvest Management Plan (enclosed in letter from Billy Frank, Jr., NWIFC and Jeff Koenings, WDFW to Will Stelle, NMFS, dated February 15, 2000) contained proposals for the 2000/2001 fishing season.

For the 2001/2002 season, the co-manager's have prepared a Harvest Management Plan for Puget Sound Chinook Salmon. The Plan states specific objectives for harvest of the 15 Puget Sound management units, the technical bases for these objectives, and procedures for their implementation. The Plan assures that the survival and recovery of the Puget Sound ESU will not be impeded by fisheries-related moratlity. The Plan is being submitted with the expectation that NMFS will reach a finding, based on the conditions stated in the 4(d) rule, that fisheries-related take in Washington waters is exempt from prohibition under Section 9 of the ESA. NMFS is currently reviewing the Plan.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Because George Adams fall chinook CWT survivals have been low (<1%) for many years, recoveries in specific fisheries vary considerably from year to year. The most consistent catches of George Adams fall chinook in recent years have occurred in the following fisheries:

Washington Strait of Juan de Fuca and Hood Canal sport fisheries
Canadian Vancouver Island, Georgia Strait and Strait of Juan de Fuca sport fisheries.

Strait of Juan de Fuca and Hood Canal treaty net fisheries
Strait of Juan de Fuca treaty troll fishery

George Adams chinook have also been caught in Alaska troll fisheries, the Canadian West Coast Vancouver Island troll fishery, the Washington ocean treaty troll, ocean non-treaty troll and ocean sport fisheries, and the Oregon troll fisheries.

For the Skokomish and Mid-Hood Canal management units (MU), during the recovery period, pre-terminal fisheries in southern U.S. areas (SUS) will be managed to ensure a pre-terminal exploitation of 15% or less, as estimated by the FRAM model. If the recruit abundance is insufficient for each MUs goal to be met, additional terminal fishery management measures will be considered.

The NMFS Section 7 consultation on the 2000/2001 PFMC, Fraser Panel and Puget Sound marine and freshwater fisheries will result in approval of the fisheries proposed in the Puget Sound Chinook Harvest Management Plan. NMFS is/has reviewing/ed the Harvest Management Plan for Puget Sound Chinook Salmon prepared by the co-managers prior to the 2001/2002 season.

3.4) Relationship to habitat protection and recovery strategies.

Hood Canal chinook Limiting factors analyses have not been completed for Hood Canal natural chinook stocks and factors for decline and recovery are not available. However, since listed chinook and listed summer chum utilize similar habitats, habitat protection and recovery strategies designed to recover summer chum (see below) will also aid in the recovery of listed Hood Canal chinook. The principle chinook streams in Hood Canal, the Skokomish, Hamma Hamma, Duckabush, Dosewallips and Big Quilcene rivers are on the westside of Hood Canal. They provide spawning and rearing habitat only in the lower river sections with relatively low gradients. Gradients rapidly become steep with impassable waterfalls, so most of these rivers are not accessible to chinook. All of these rivers, especially the Skokomish and Big Quilcene have suffered damage from human activities (dams, roads, logging, diking, agriculture and development) which have exacerbated natural summer low flows, winter flooding and streambed scouring, and sediment deposition due to unstable soils and slopes. Large woody debris is lacking in most areas used by chinook as a result of forest practices. In the Skokomish, the Cushman hydropower project on the North Fork has reduced stream flow in the Skokomish by about 40% and has altered the normal pattern of sediment delivery to the estuary with the result that eelgrass has been lost (WDFW and WWTIT 1994). Gravel aggradation and removal have been problems in the lower Big Quilcene.

Summer chum. Summer chum supplementation, habitat restoration and management measures are integrated as presented in the Summer Chum Salmon Conservation Initiative (WDFW and PNPTT 2000). The SCSCI provides a standardized approach to determine freshwater and estuarine limiting factors in each summer chum watershed. Habitat factors for decline and recovery for each watershed are described. In addition, at the summer chum ESU scale, protection and restoration strategies for each limiting factor for decline are provided. The goal of the habitat protections and restoration strategy is to maintain and recover the full array of watershed and estuarine-nearshore processes critical to the survival of summer chum across all life stages.

Hood Canal summer chum in westside Hood Canal streams (Lilliwaup Cr., Hamma Hamma, Duckabush, Dosewallips, Big Quilcene and Little Quilcene are affected by much the same habitat conditions as Hood Canal chinook, especially by habitat perturbations such as diking, streambed instability/gravel aggradation in the lower stream reaches. On the eastside, Hood Canal summer chum streams such as the Union River and Big Beef Creek are low elevation, low gradient streams which are being heavily impacted by rapid development on the Kitsap Peninsula. Logging and associated road construction have historically created conditions which increased sediment delivery to streams and reduced the supply of large woody debris to streams.

Bull trout. Bull trout in the Hood Canal region are found in the South Fork Skokomish, Lake Cushman and the upper North Fork Skokomish above Staircase Falls. The condition of the South Fork is poor, as mentioned above. Lake Cushman is now a reservoir, and the water level in the one-half mile of the North Fork Skokomish just above the reservoir fluctuates too much to provide stable spawning habitat. Further, the upper and lower Cushman dams have eliminated the anadromous life history form from the North Fork. However, most of the North Fork above Lake Cushman is in the Olympic National Park, and the Habitat is essentially pristine.

Habitat Protection Efforts and Probable Benefits:

Habitat protection efforts include the Northwest Forest Plan, adopted by the Forest Service and the Bureau of Land Management in the Northwest in 1994. The plan requires increased stream buffers to protect stream habitat for salmonids and limits road construction and some forms of logging on steep/unstable slopes. Most of the Olympic National Forest is in Late Successional Reserves which limits logging to thinning in stands under 80 years old and severely limits or prohibits logging in older stands. The Forest Service is updating road inventories and embarking on a long-term program to improve or close some of the roads which pose the greatest threats to slope stability and streams. Within Washington State, the Forests and Fish Report, prepared by the USFWS, NFMS, EPA, Office of the Governor of the State of Washington, WA DNR, WDFW, WA DOE, the Colville Tribes, Washington counties, and timber industry groups, was accepted by Washington Legislature in 1999. The emergency forest practices rules which were developed from the Report will result in some improvements in state and private forest land management including increased stream buffers and some reduction in logging in riparian areas and unstable upslope areas. Both the federal and state and private forest plans will result in habitat improvements, but are far from ideal for fish. The resulting improvements in fish habitat, such as increased large woody debris in streams, may not be realized for decades given the very poor current conditions of many fish-bearing streams and their riparian areas.

The George Adams Hatchery is making a modest contribution to habitat improvement by donating fish carcasses to an Olympic National Forest Service (Hood Canal District) crew which places the carcasses in streams and riparian areas for nutrient enhancement. In 1997 and 1998, a total of nearly 1,500 George Adams fall chinook were donated to the nutrient enhancement program.

3.5) Ecological interactions.

Summer Chum The SCSCI provides an assessment of risks to summer chum juveniles and adults posed by the production of George Adams Hatchery fall chinook, summer chum risk averse measures to implement, and monitoring and evaluation measures to be applied to minimize any risks.

Fall Chinook The risks and benefits posed by hatchery-origin juvenile chinook to wild juvenile chinook will depend on the number, size, release time and stream residence time of the hatchery fish. George Adams releases approximately 3.8 million fingerling smolts annually.

Competition and Predation: As mentioned earlier, George Adams smolts are expected to migrate quickly to Puget Sound, however, their actual stream residence time and freshwater competition between George Adams chinook and wild Skokomish-basin chinook have not been examined. These smolts are released at a size of about 80 to 100 mm in May when wild Skokomish smolts are expected to be about 60 to 80 mm long (D. Seiler, WDFW, personal communications, February, 2000). The USFWS (1994) has suggested that juvenile salmonids can consume fish which are one-third or less their own body length. Given this rule of thumb and approximate sizes of hatchery and wild fish at the time George Adams chinook are released, predation by hatchery smolts is not expected to be a significant problem.

The numbers of wild chinook smolts have been estimated for the Skokomish basin and all of Hood Canal and are compared with numbers of hatchery chinook released in the table below.

Table 22. Comparison of wild and hatchery chinook smolts in the Skokomish River and in all of Hood Canal. Hatchery chinook include those released from George Adams, Hoodsport, Long Live The Kings and the U of W at Big Beef Creek.

Area	Wild Smolts[1]	Hatchery Smolts	Hatchery Yearlings
Skokomish River	104,400	3,830,000	120,000
Hood Canal Streams	132,000	3,310,000[2]	250,000

[1]Wild smolt numbers were estimated by averaging the 1995-1998 wild escapements in Hood Canal, halving that number to estimate the number of female spawners, applying a fecundity of 4,000 eggs per female (Bill Tweit, WDFW, personal communication) to estimate the total number of eggs produced, then applying a freshwater survival rate of 5% (Bill Tweit, WDFW, personal communication) to the egg estimate to estimate the number of surviving smolts.

[2]Includes 200,000 chinook released into Big Beef Creek by the University of Washington, 110,000 chinook released into the Hamma Hamma River by Long Live the Kings and 3,000,000 fingerlings released into Finch Creek by WDF&W.

The Species Interaction Working Group (SIWG) (1984) categorized various risks to wild salmon species and steelhead from hatchery-origin salmon species and steelhead. Their assessment of risks to wild chinook from hatchery chinook are summarized below.

Table. Risks posed by hatchery-origin chinook to wild chinook. Data from SIWG (1984).

- Type of Risk	- Level of Risk
Freshwater predation	Unknown
Freshwater competition	High potential
Early marine predation	Unknown
Early marine competition	High potential

The high risk of competition assumes significant temporal and spatial overlap between hatchery and wild juvenile chinook and increases when numbers of hatchery fish released are far larger than numbers of wild fish (SIWG 1984). We have no information on hatchery-wild overlaps in the Skokomish basin or in the waters of Hood Canal. Clearly the number of juvenile hatchery chinook greatly exceeds the estimated number of wild juveniles in the Skokomish basin and throughout Hood Canal which may increase the risk of competition or attraction of fish and avian predators.

Releases of hatchery chinook may confer some benefits to wild chinook. The George Adams Hatchery fry released by the Skokomish tribe may serve as food for outmigrating wild fish. If hatchery and wild chinook juveniles occupy the lower Skokomish and the same areas of Hood Canal at the same time, the large excess of hatchery fish may provide wild chinook with some protection from fish and avian predators.

Behavior modification: If large numbers of hatchery chinook are released into watersheds containing younger and/or smaller wild juveniles, they can stimulate premature outmigration in wild fish via a Pied Piper effect (Hillman and Mullan 1989). Premature outmigration can reduce survival of wild fish because they would be smaller than normal size, making them more vulnerable to predation, and they may not have completed the physiological changes required to adapt to life in salt water. We do not know if this is a concern in the Skokomish basin.

Disease Transmission: It is possible that hatchery fish which have been infected by transmissible pathogens or effluent from hatcheries with sick fish could infect wild fish. Hatchery effluent is not tested for pathogens, so we do not know if George Adams is releasing pathogens into the environment. However, disease transmission from hatchery to wild fish does not appear to occur routinely, possibly because pathogen spread does not occur as readily in less crowded wild fish as in hatchery fish (Tynan 1999).

Adult Interactions: The ecological interactions between wild and hatchery adult chinook which are of special concern are competition for spawning areas and competition for mates. We have no specific information on possible competition. We know (see Section 2.2.2 above) that George Adams chinook do stray onto wild spawning grounds in the Skokomish basin, however, we do not know to what extent they compete with wild chinook.

Bull Trout We have no information on interactions between George Adams chinook and wild bull trout in the Skokomish (the only watershed in the Hood Canal currently known to have native char). The risk of competition between hatchery chinook juveniles and bull trout is unknown. Presumably, competition can occur where wild and hatchery fish overlap, and space or food are limiting, but juvenile distribution of bull trout in the South Fork Skokomish is not known in detail. South Fork Skokomish bull trout are found overwintering as far down as the confluence with the North Fork (L. Ogg, USFWS, Hood Canal Ranger District, personal communication, February, 2000), but whether they overlap with George Adams chinook when these fish are released in May is unknown. Predation risks to bull trout from hatchery chinook are likely to be low, since the smallest native char juveniles are likely to be found in the uppermost portions of the Skokomish watershed. By the time South Fork fluvial or possibly anadromous char reach lower river reaches where they are more likely to overlap with hatchery juveniles, they may be too large to be preyed upon. Spawning grounds of South Fork bull trout have not been identified in detail, but are unlikely to overlap with those of fall chinook, so competitive interactions on spawning grounds are unlikely to occur.

Bull trout from the North Fork Skokomish (Lake Cushman and Upper North Fork stocks) are unlikely to pass through the hydropower projects to interact with George Adams chinook.

Recent analysis using the Risk Assessement (WDFW, 2001) indicates that the probability of competition on listed fish by the fingerling program is high and the probability of predation is low (fish released at a similar size as the listed fish).

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

George Adams Hatchery: Water for the George Adams Hatchery is supplied from Purdy Creek, three wells and Ellis Spring. Well water is currently used for incubation and also for rearing any fish which require pathogen-free water. This generally means fish which are transferred to George Adams for short-term rearing can be then transferred out of the Fish Health Management Zone. George Adams fall chinook are reared on Purdy Creek water which should minimize straying into other watersheds.

The water right for Purdy Creek is 21.3 cubic feet/second (cfs). Flow in Purdy Creek has diminished in recent years because of drought conditions and development in the watershed. Because of its proximity to Highway 101, Purdy Creek is at risk from contamination from spills on the highway. One such spill of zinc occurred several years ago.

The water right for Ellis Spring is 2.5 cfs. Flow is variable from a low of 1.0 cfs to 2.5 cfs.

The water right for George Adams wells is 6.4 cfs. The wells are used only for incubation or in instances when pathogen-free water is required. Otherwise, they are not used in order to allow the aquifer to recharge.

George Adams has an NPDES permit. There is no pollution abatement pond. Vacuumed pond wastes are applied to the wetland next to the hatchery. Hatchery effluent has not violated the conditions of the NPDES permit.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Intake screens conform to minimize the risk that wild juvenile salmonids could enter the fresh water intake. There are no wild chinook above the Purdy Creek intake. There is no formal pollution abatement pond at George Adams. Hatchery effluent is discharged into an adjacent wetland at George Adams and does not violate the conditions of the NPDES permit. The Production Division has proposed installation of a clarifier to treat effluent before routing it to the wetland, if funding becomes available.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

George Adams Hatchery: Adult broodstock collection occurs in a 71' X 157' X 27" trap/holding pond located in Purdy Creek. The trap begins operation August 1 for chinook and remains open through the end of the chum run in early December.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

George Adams Hatchery: It is not typically necessary to transport adult broodstock on site, however, they are transported in a 400 gallon planting tank with supplemental oxygen and recirculation motors when necessary.

5.3) Broodstock holding and spawning facilities.

George Adams Hatchery: Adult broodstock are held in the trap/holding pond until they are spawned. Spawning facilities are located adjacent to the trap/holding pond.

5.4) Incubation facilities.

George Adams Hatchery: Chinook eggs are incubated to eyed-egg stage in Simms deep troughs which are each loaded with 450 pounds of eggs (approximately 900,000 chinook eggs). Egg density in the deep troughs is 19 pounds per cubic foot (lbs/cu.ft). After eyeing, eggs are transferred to vertical stack incubators for hatching. Egg density at hatching is 5.5 pounds per tray (approximately 9,900 chinook eggs).

5.5) Rearing Facilities

George Adams Hatchery: After hatching, chinook eggs are moved from the incubators into 3- 20' X 77' X 31" raceways for initial rearing. 2.4 million fish are then transferred from the raceways to a 61' X 167' X 55" gravel-bottomed rearing/release pond (Pond 9) with a maximum density of 1.26 lbs/cu.ft. at release and 1.4 million fish are transferred from the raceways to a 48' X 240' X 33" gravel-bottomed rearing/release pond (Pond 7) with a maximum density of 1.29 lbs/cu.ft at release.

5.6) Acclimation/release facilities.

George Adams Hatchery: As they grow chinook juveniles are split into two gravel-bottomed rearing/release ponds with a maximum density of 1.29 lbs/cu.ft. at release.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

Severe flooding at George Adams Hatchery in 1997 led to the early release of 1,949,600 chinook fry. Some of these died, but the number is not known.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

George Adams Hatchery is staffed full time with resident professional staff. The hatchery is equipped with alarm systems and backup generator to provide auxilliary power in the event of a power failure. There are provisions at George Adams Hatchery for switching to alternate water sources in the event of the loss of one water source.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

George Adams fall chinook originated in 1961 from the Hoodsport Hatchery stock. The Hoodsport stock was started in 1952 with a release of Dungeness spring/summer chinook. This was followed by several years of Soos Creek (Green River) releases until the stock became (largely) self sustaining at Hoodsport. Additional inputs at Hoodsport include chinook from Tumwater Falls (largely derived from Soos Creek), Voights Creek (Puyallup basin), Big Beef Creek, Minter Creek and Trask River, Oregon hatchery populations. The actual contribution of these various hatchery stocks to the George Adams stock is unclear. WDF&W shall continue the use of gametes procured from fall chinook salmon adult volunteering to the George Adams to effect the program.

6.2) Supporting information.

6.2.1) History.

The Green River fall chinook stock originated from adults collected in the Green River. The stock was propagated at the Soos Creek Hatchery and disseminated widely throughout Puget Sound hatcheries. The hatchery began operation in 1901 and we assume that fall chinook broodstock collection began at that time.

Dungeness chinook are a spring/summer stock native to the Dungeness. They were not successfully introduced at Hoodsport and may not have contributed significantly to the George Adams stock.

The Voights Creek stock originated from Voights Creek chinook but had significant infusions of Soos Creek fish. The Minter Creek fall chinook stock is a Soos Creek derivative via Soos Creek and the Deschutes. Trask River chinook stock are derived from Tillamook Bay tributary stock.

There have not yet been three consecutive generations of chinook releases based solely on adult returns to the hatchery because there are frequent egg transfers from Hoodsport Hatchery. George Adams has achieved its egg-take goals less than 50% of the time in the past 12 years, largely due to low flows in Purdy Creek and difficulty encountered by the adults in negotiating a swamp below the hatchery outfall. Consequently, the George Adams stock is considered introduced and not locally adapted at George Adams. A genetic analysis of George Adams chinook was done during 1999 and no significant differences were found overall between George Adams and Hoodsport hatcheries. It did appear that Hood Canal area populations formed a group differentiated from south Puget Sound populations, although at a relatively low level. This is noteworthy given the history of stock transfers between the two years (memo from Anne Marshall, WDFW, 31 May 2000)

and may indicate local adaptation is occurring in the Hood Canal hatchery stocks. Also, the difference between South Sound and Hood Canal area populations may be due to that Hood Canal fish have retained some of their historical genetic characteristics.

No intentional selection for any characters such as size or run timing has been conducted. In most years, insufficient chinook return to the hatchery to achieve the eggtake goal (4.57 million eggs), so nearly all chinook returning to the hatchery are spawned, and it is unlikely that any consistent inadvertent selection has occurred.

6.2.2) Annual size.

Approximately 2,670. Wild chinook are not intentionally collected for broodstock. As mentioned earlier, it is not possible to distinguish wild chinook from unmarked hatchery fish, so if wild chinook enter the trap and adult holding pond, they will likely be spawned. The number of wild fish spawned, if any, is not known.

6.2.3) Past and proposed level of natural fish in broodstock.

Unknown

6.2.4) Genetic or ecological differences.

See section 6.2.1.

6.2.5) Reasons for choosing.

The Hoodsport Hatchery broodstock was the closest stock and was selected for that reason.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adults

7.2) Collection or sampling design.

WDF&W shall procure gametes from adults volunteering to George Adams to effect the programs at those particular sites.

At George Adams Hatchery the adult trap (a wooden picket trap) is opened by August 1 each year. Fall chinook return to George Adams from early August through mid-September with a peak in early September. Fish enter the adult holding/juvenile release pond and are held until they are ready to spawn, typically about a week. The trap is only closed when the maximum carrying capacity for broodstock has been reached. The trap is effective in trapping returning adults, however, some natural spawning does occur below the trap on low-water years.

There are no known features of the trap which would lead to collection of a non-representative sample of chinook. As mentioned earlier, numbers of chinook entering the trap are usually insufficient to meet eggtake goals. Consequently, nearly all chinook are spawned, making it unlikely that a timing bias has been introduced into broodstock collection.

7.3) Identity.

Unmarked hatchery-origin chinook cannot presently be distinguished from wild fish.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

For George Adams, there is no specific program goal for adult broodstock collection, only for eggtake of 4.57 million fall chinook eggs. Assuming a fecundity of 4,500 eggs per female and a 60% male / 40 % female sex ratio, and a prespawning mortality of < or = 5%, the number of adults required to meet the eggtake goal would be about 2,670. Note that the 2000 eggtake of 4.57 million has been reduced from the previous goals of 5.72 million.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

George Adams:

Year	Adults Females	Males	Jacks	Eggs	Juveniles
1988	980	3,463	12	3,692,400	
1989	1,155	1,339	18	5,103,200	
1990	637	1,548	15	2,188,000	
1991	1,623	1,445	15	7,177,000	
1992	103	191	3	443,000	
1993	290	322	4	1,174,000	
1994	109	386	2	464,000	
1995	1,599	1,563	34	6,821,000	
1996	1,347	1,300	12	5,281,600	
1997	762	733	3	2,814,000	
1998	863	911	30	3,002,000	
1999	1,144	1,152		4,500,000	
2000	979	857	14	4,349,900	
2001	1,309	1,300	7	5,668,100	

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Chinook collected in excess of eggtake needs at George Adams are killed rather than passed upstream. There are currently no upstream escapement goals for Purdy Creek. In 1995, 173 males, 78 females and 15 jacks were hauled from George Adams to the Skokomish River to spawn naturally, but this was an exception. See below for information on carcass disposal.

7.6) Fish transportation and holding methods.

George Adams adult chinook are not generally transported. When they are, hauling is carried out using WDFW loading rate guidelines which specify densities for salmon of different species and sizes, oxygen levels, salinity and disinfection procedures (WDFW undated).

7.7) Describe fish health maintenance and sanitation procedures applied.

Fish health measures are consistent with the Co-Managers fish health policy (NWIFC and WDFW 1998).

7.8) Disposition of carcasses.

The disposition of chinook carcasses at George Adams depends upon the condition of the carcasses and whether the fish had been treated with drugs. Drug-treated fish are buried on station or in a local landfill. Carcasses of untreated fish, both spawned and unspawned may be sold to a contracted buyer, donated to a food bank, tribe or used as part on an approved nutrient enhancement program.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Until co-manager agreement on 100% mass marking, no special risk aversion measures are in place to protect listed wild fish from being incorporated into the broodstock.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

All ripe fish are selected randomly for spawning from available broodstock.

8.2) Males.

Males are selected randomly and mated 5 X 5 with the females.

8.3) Fertilization.

Eggs and milt is mixed, 5 X 5, and allowed to set for a minute. Fertilized eggs are pooled and taken to the hatchery for distribution into the incubators.

8.4) Cryopreserved gametes.

Not used.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

No wild-origin adults will be knowingly spawned.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

From Hood Canal Operational Plan:
George Adams:
Green Egg to Fry Survival: Range of 82.7% to 99.2%
Fry to Fingerling Smolt Survival: Range of 95.8% to 99.2%

9.1.2) Cause for, and disposition of surplus egg takes.

Egg takes shall be managed to limit the likelihood of surplus eggs.

9.1.3) Loading densities applied during incubation.

At George Adams green eggs are bulk eyed in deep troughs. When they eye they are hatched in vertical incubators at a rate of 5.5 lbs eggs per tray.

9.1.4) Incubation conditions.

At George Adams Hatchery eggs are incubated and hatched on well water.

9.1.5) Ponding.

Fry are forced ponded when yolk absorption is 95%+ complete.

9.1.6) Fish health maintenance and monitoring.

Fish health is monitored on a routine basis by the Area Fish Health Specialist. If needed, treatment plans are prescribed in accordance with the WDFW Fish Health Manual and Policies

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

N. A.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.

From Hood Canal Operational Plan:

George Adams:
Green Egg to Fry Survival: Range of 82.7% to 99.2%
Fry to Fingerling Smolt Survival: Range of 95.8% to 99.2%

9.2.2) Density and loading criteria (goals and actual levels).

In general, loading and density levels conform to standards and guidelines set forth in Piper, et. al., 1982.

9.2.3) Fish rearing conditions

At George Adams the fish are reared in ambient surface water from Purdy Creek.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Fish are weight sampled weekly and feed rates are adjusted to achieve a proper size and time of release.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Not available.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Fish are reared in a diet of Bio Oregons' Bio-Diet Starter and Grower feed at rates between 1.7 and 2.5% B.W./day.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

See 9.1.6

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Physical appearance and behavior are used to judge smolt development.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

None.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

The core fall chinook program at George Adams is the release of 3.8 million fingerling smolts, to be released in mid-May at a size of 60- 80 fpp (1999 Current Brood Document). Samples of fish are weighed and measured prior to release to estimate variation in size. The goal of the rearing program is to attain a coefficient of variation for weight/length of 10.0 or less in order to decrease the likelihood that the growth or development of some fish will be retarded. Such fish would be more likely to residualize in fresh water and interact with listed wild fish.

Table. Core chinook program at George Adams Hatchery showing on-station fingerling releases.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	3,800,000	60-80	May	Purdy Creek
Yearling				

Data from 1999 Current Brood Document.

Table. Programmed releases of George Adams fall chinook transferred from the hatchery to the HCSEG conservancy projects (see Rick's Pond HGMP).

Age Class	Maximum Number	Size (fpp)	Release/Transfer Date	Location	Group
Fry Fingerling	30,000	80 fpp	June	Skokomish River	HCSEG(LLTK)

Data from 1999 Current Brood Document.

Actual release data by these groups are generally either not reported to WDFW or may be reported but not transmitted to the keepers of the WDFW Hatcheries data base. Please contact the WDFW Cooperative Extension, Outreach and Partnerships Program for more information on releases by the region fish enhancement group (Hood Canal Salmon Enhancement Group) or other volunteer projects.

10.2) Specific location(s) of proposed release(s).
Stream, river, or watercourse:
Release point:
Major watershed:
Basin or Region:

George Adams fall chinook are released into the following rivers or streams:

Purdy Creek (16.0005)((R 1.8) in the Skokomish watershed, Hood Canal Region (WDFW George Adams Hatchery)

Skokomish River: Rick's Pond (Long Live the Kings): Located near the mouth of an unnamed trib (16.xxxx) of the lower Skokomish R. (16.0001) at RM 2.9 near Union, Washington. Basin name: Hood Canal.

10.3) Actual numbers and sizes of fish released by age class through the program.

George Adams:

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988					5,063,481	101 fpp		
1989	3,769,500 (eggs)		4,750,965	269 fpp	3,291,056 240,179	144 fpp 62 fpp		
1990	672,000 (unfed fry)		5,635,200	621 fpp	4,177,000	65 fpp		
1991					4,527,400	70 fpp		
1992	1,700,000 (unfed fry)		1,546,900 5,604,958	376 fpp 225 fpp				
1993					3,926,912	72 fpp		
1994					1,317,200	79 fpp		
1995					1,508,750	49 fpp		
1996					3,504,032 *28,500*	71 fpp 80 fpp		
1997			1,949,600 (flood loss)	~240 fpp	1,811,338	70 fpp		
1998	491,700 (excess)	1,448 fpp			3,865,355	72 fpp		
1999					3,468,321 *35,000*	74 fpp 85 fpp		
2000					3,779,853	76 fpp		
2001					3,835,620	69 fpp		
Average	552,766	140	1,623,963	345 fpp	3,390,486	78 fpp		

Note: above numbers in *italics* = *Endicott Pond* (Ricks Pond)

Data source: WDFW Hatcheries data base. 1988-1994 data are from Plants table. 1995-1999 data are from form 4 table. (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

10.4) Actual dates of release and description of release protocols.

George Adams chinook are generally released in mid-May when they exhibit strong migratory behavior (schooling and swimming around ponds) and migratory appearance (silver body coloration). Release is volitional for the first 24 hours and the fish are free to leave. After about 24 hours, the water level in the ponds is lowered to flush out the remaining fish. Fish are released between mid-May and mid-June each year.

10.5) Fish transportation procedures, if applicable.

Not applicable

10.6) Acclimation procedures

The major water source for rearing at George Adams is Purdy Creek which should increase the likelihood that chinook reared and released on-station will return to the hatchery.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

George Adams releases a Double-Index Tag (DIT) group of adipose-fin clip/coded-wire tagged chinook fingerlings. 225,000 of the on-station fingerling smolt release is coded-wire tagged and adipose-fin clipped each year. An additional 225,000 of the on-station fingerling smolt release are coded-wire tagged without an adipose-fin clip (all returning fish will be wanded to prevent taking of natural fish).

WDFW shall apply an identifiable mark to 100% of the fall chinook production released through the George Adams, Hood Canal and Recreational Enhancement Plan (REP) (Ricks Pond) hatchery programs each year to allow monitoring and evaluation of the hatchery program production and provide NOR/HOR ratios on the spawning grounds. The DIT group can serve as an index group for wild fingerling fall chinook as well as providing data on catch contributions, run timing, total survival, migration patterns and straying into other watersheds.

The average weighted proportion of tagged and marked fish released yearly since 1995 is shown below in Table.

Table. Proportion of yearly releases of George Adams chinook which are coded-wire tagged and /or adipose-fin clipped.

Year	Proportion CWT + AD
1995	15%
1996	6%
1997	6%[1]
1998	5%[2]
1999	13%

[1]Includes 1,949,600 unmarked fry released early due to flooding.

[2]Includes the 491, 700 unmarked excess fry released early.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Beginning with the 1999 brood year, any excess George Adams chinook fry (resulting from higher than expected survival) will be released into landlocked lakes in the Hood Canal area following consultation with the tribes.

10.9) Fish health certification procedures applied pre-release.

Each lot of fish is examined by a WDFW Fish Health Specialist prior to release or transfer, in accordance with the Co-Managers Salmonid Disease Policy.

10.10) Emergency release procedures in response to flooding or water system failure.

In the event of a water system failure, screens would be pulled to allow fish to exit the pond. In some cases they can be transferred into other rearing vessels to prevent an emergency release. In cases of severe flooding the screens are not pulled. Past experience has shown that the fish tend to home down to the bottom of the pond and only those that are inadvertently are swept out are allowed to leave.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

Chinook released from George Adams are released only as subyearling smolts, generally in mid-May. Releasing subyearling smolts should reduce the likelihood of hatchery fish preying on wild chinook since wild chinook are expected to be nearly as large as the hatchery fish at the time of release. Hatchery chinook would probably be smaller than any fluvial or anadromous bull trout which they might encounter in the lower Skokomish. Wild summer chum are considered extirpated in the Skokomish River so adverse effects in fresh water are not expected.

We know nothing about saltwater interactions between hatchery chinook and listed wild chinook and summer chum, but we expect that wild summer chum would have cleared lower Hood Canal before the chinook are released.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

See section 1.10 for Monitoring and Evaluation.

The purpose of a monitoring program is to identify and evaluate the benefits and risks which may derive from the hatchery program. The monitoring program is designed to answer questions of whether the hatchery is providing the benefits intended, while also minimizing or eliminating the risks inherent in the program. A key tool in any monitoring program is having a mechanism to identify each hatchery production group.

Each production group shall be identified with distinct otolith marks, adipose clips, coded wire tags, blank wire tags or other identification methods as they become available, to allow for evaluation of each particular rearing and/or release strategy. This will allow for selective harvest on hatchery stocks when appropriate, monitoring of interactions of hatchery and wild fish wherever they co-mingle in riverine, estuarine and marine habitats and assessment of the status of the target population. WDFW shall monitor the Chinook salmon escapement into the target and non-target Chinook populations to estimate the number of tagged, un-tagged and marked fish escaping into the river each year and the stray rates of hatchery Chinook into the rivers.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

Benefit Indicator 1: Achieve broodstock/eggtake goals to provide fish for stable, predictable fishery

The maximum number of spawners needed to meet the eggtake has been determined to be 2,900 (1,450 females and 1,450 males). Because fish are not sorted by sex at the time they enter the adult pond from the trap, more than 2,900 chinook will be collected. The number of spawning days is planned in advance, based on typical return timing. The number of males and females to be spawned on each day can be determined. The risk is that the number of females will fall short of the number needed, and eggtake will be less than required.

Egg takes are estimated at the time of spawning and refined after shocking and picking.

Benefit Indicator 2: communicate within WDFW and with tribes, citizen groups, private citizens and federal agencies regarding program goals and production objectives. meet ESA recovery requirements and Wild Salmonid Policy requirements.

WDFW staff and PNPTC/tribal staff communicate if production changes are proposed. Production changes involving the regional fish enhancement group, Hood Canal schools or volunteer co-op groups are communicated through the WDFW Cooperative Extension, Outreach and Partnership Program. The changes in goals and production levels which result from these discussions are reflected in the Future Brood Document compiled by WDFW. Recently NMFS has also become involved in discussions of changes to production at George Adams affecting the region fish enhancement program.

WDFW and NMFS are engaged in discussions of hatchery chinook production and release in Hood Canal to ensure that agency hatchery programs to be consistent with recovery requirements. Aspects of hatchery physical plant and operations which may conflict with the Wild Salmonid Policy will be reviewed by WDFW staff assigned to implement the policy.

Benefit Indicator 3: Provide carcasses for Skokomish nutrient enhancement program.

This is an ad hoc program conducted by the Forest Service. The hatchery provides carcasses as available and needed for nutrient enhancement.

Risk Indicator 1: Reduce hatchery broodstock collection impacts on wild fish

In order to avoid collecting wild chinook for spawning, they must be separable from all hatchery chinook and be returned to the Skokomish River. This is currently not possible for two reasons. First, unmarked hatchery fish cannot currently be distinguish from wild fish. Second, wild fish entering the hatchery need to be identified and returned quickly to the river. There is no system to return wild adults directly to the river.

The problem of distinguishing wild from hatchery fish could be addressed by marking all hatchery fish. The state and the PNPT tribes are discussing the need to mass mark chinook in Hood Canal. The problem of separating hatchery and wild fish once they can be identified could be solved if the adult pond could be divided and a sorter were installed at the trap or the entrance to the pond. Once wild fish can be sorted from hatchery fish, they can be returned to the Hood Canal for release. We must be aware, however, that even with mass marking, a small number of unmarked hatchery fish may return depending on the proportion of "bad clips or marks" at the time of marking.

Risk Indicator 2: Reduce interactions between hatchery and wild juvenile fish.

This would require monitoring of hatchery smolts following release into Purdy Creek and determination of the temporal and spatial distribution of juvenile bull trout and wild chinook.

Risk Indicator 3: Maintain hatchery stock integrity and genetic diversity.

This requires that no chinook form outside the Hood Canal region be introduced into George Adams. It also requires also that the spawning population be sufficiently large to avoid significant effects of genetic drift and that spawners represent the entire run timing.

Risk Indicator 4: Meet disease prevention and control standards in Co-Managers Salmonid Disease Policy. This requires that measures prescribed for examining fish to be transferred or released be followed, that routine health inspections be conducted and that disease outbreaks be contained quickly.

Risk Indicator 5: Reduce interactions between hatchery adults and wild adult spawners on the spawning grounds.

This would require monitoring the adult return numbers, ratios, and interactions between hatchery-origin and wild-origin adult spawners to assess the status of the target population.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Benefit Indicator 1: Staff funding and manpower to count hatchery adult returns and determine eggtakes needs are available at the current level.

Benefit Indicator 2: Staff and funding are available to carry out discussions of production programs at George Adams and to make changes to the Future Brood Document to reflect those changes.

Benefit indicator 3: Staff and funding are available to provide chinook carcasses for a Forest Service crew to pick up and distribute in the watershed.

Risk Indicator 1: Funding in not currently available to construct a means of separating wild and hatchery fish at the hatchery.

Risk Indicator 2: The staff, funding and logistical support are not available to undertake monitoring of hatchery smolts, determination of the extent to which they overlap with wild fish and the effect of the overlap.

Risk Indicator 3: Only hatchery returns, volunteering to the George Adams Hatchery shall be used to effect this program.

Risk Indicator 4: Disease prevention and control measures is monitored in the monthly fish health reports for George Adams.

Risk Indicator 5: WDFW shall monitor chinook salmon escapement to the Skokomish River sites to estimate the number of tagged, untagged, and marked fish escaping to the River each year. This monitoring will allow for assessment of the status of the target population.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

It is anticipated that adherence to monitoring and evaluation protocols will not elevate risk to listed chinook salmon.

SECTION 12. RESEARCH

The only research being conducted in direct association with the George Adams fall chinook program was genetic analysis of a sample of adults at the hatchery during the 1999 spawning season.

12.1) Objective or purpose.

To determine the genetic relationship between the George Adams hatchery fall chinook stock and naturally-spawning fish in the Skokomish, Hamma Hamma, Duckabush, Dosewallips and Quilcene rivers.

Sampling at George Adams Hatchery was conducted in 1999. Further, hatchery sampling will probably not occur until 2003 or 2004 (the next generation of chinook).

12.2) Cooperating and funding agencies.

WDFW with some funding from the Pacific Salmon Treaty.

12.3) Principle investigator or project supervisor and staff.

Anne Marshall, Genetics Unit, WDFW conducts the analyses. Rick Ereth, WDFW Genetics Unit, coordinates sample collection by WDFW Genetics Sampling crew members, WDFW regional Fish Program staff or hatchery staff.

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

See section 2.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

The Genetics Sampling crew or hatchery staff removes tissue samples (heart, eyefluid, liver, muscle and fin or operculum) for allozyme and DNA analysis from fresh chinook carcasses at the hatchery. Typically tissue samples are obtained from 100 chinook (50 females and 50 males) taken throughout the run and spawn timing.

The Genetics Sampling Crew and/or regional Fish Program staff snag spawned out chinook and kill them by a blow to the head or sample recently dead chinook (gills still red) on spawning grounds in the streams listed above.

12.6) Dates or time period in which research activity occurs.

Tissue collection at the hatchery occurs on spawning days from mid-September through late October. Tissue collection in the field occurs during the same time period.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

Not applicable.

12.8) Expected type and effects of take and potential for injury or mortality.

Hatchery fish are dead at the time of sampling. Currently all field-sampled fish are killed prior to tissue collection.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

The level of lethal spawning and subsequent sampling of listed (wild) chinook at the hatchery is unknown, but is likely less than 100 fish since the entire sample is 100 fish. The level of take of fish on the spawning grounds would not exceed 100 fish in each major drainage.

12.10) Alternative methods to achieve project objectives.

If NMFS determines that killing spawned out and moribund fish on spawning grounds cannot be continued, genetic analysis could continue using fin clips from live fish. Some allozyme analysis has been conducted on fin tissue from chinook, but such a change in sampling would likely result in a change from allozyme to DNA analysis. If the take incurred during this sampling were judged acceptable to NMFS, and if WDFW were able to install a weir or trap to collect live fish, sampling could continue. However, it should be noted that the baselines for DNA would not be comparable to those available for allozymes for some time to come.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

None.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

None.

SECTION 13. ATTACHMENTS AND CITATIONS

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Washington Department of Fish and Wildlife and Point No Point Treaty Tribes. 2000. Summer Chum Salmon Conservation Initiative: An Implementation Plan to Recover Summer Chum Salmon in the Hood Canal and Strait of Juan de Fuca Region. Jim Ames, Gary Graves, and Chris Weller, editors. Fish Program, Washington. Department of Fish and Wildlife, Olympia. 423 p. + app.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

The uncertainty indicated in the table below for adult collection and spawning, incubation and juvenile rearing, release and genetics sample collection once again reflects the fact that we cannot distinguish wild chinook from unmarked hatchery chinook at the hatchery. If wild listed chinook enter the hatchery, they will be retained and killed for spawning, surplussing, nutrient enhancement, etc. Fish killed and sampled (tissues collected for genetic analysis) could be either unmarked hatchery fish returning to the sites from which they were released, hatchery strays or wild chinook. We do not have good information on the proportions of chinook in these categories.

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Fall chinook ESU/Population: Puget Sound Chinook (Hood Canal)
Activity: George Adams Hatchery production

Location of hatchery activity: George Adams Dates of activity: August 1- July 31 Hatchery program operator: Denis Popochock

Type of Take	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)			Unknown	
Intentional lethal take f)				
Unintentional lethal take g)	Unknown	Unknown	Unknown	
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.